GLOSSARY

[0012] Amplitude—The instantaneous amplitude of an oscillating quantity (e.g. sound pressure) is its value at any instant, while the peak amplitude is the maximum value that the quantity attains. Sometimes the word peak is omitted when the meaning is clear from the context.

[0013] Beats—Periodic fluctuations that are heard when sounds of slightly different frequencies are superimposed.

[0014] Clinical types of Tinnitus—Refers to a specific entity that can be identified by clinical and laboratory means.

[0015] Combination tone—A tone perceived as a component of a complex stimulus that is not present in the sensations produced by the constituent components of the complex when they are presented alone.

[0016] Cycle—That portion of a periodic function that occurs in one period.

[0017] Dichotic—The sounds reaching the two ears are not the same.

[0018] Diotic—The sounds reaching the two ears are the same.

[0019] Frequency—For a sine wave, the frequency is the number of periods occurring in one s. The unit is cycles per second, or Hz. For a complex periodic sound, the term repetition rate is used to describe the number of periods per second (pps).

[0020] Harmonic—A harmonic is a component of a complex tone whose frequency is an integral multiple of the fundamental frequency of the complex.

[0021] Loudness—Subjective impression of the intensity of a sound, or the intensive attribute of an auditory sensation, in terms of which sounds may be ordered on a scale extending from quiet to loud.

[0022] Masking—The amount (or the process) by which the threshold of audibility for one sound is raised by the presence of another (masking) sound.

[0023] Octave—The interval between two tones when their frequencies are in the ratio 2:1.

[0024] Phase—The phase of a periodic waveform is the fractional part of a period through which the waveform has advanced, measured from some arbitrary point in time.

[0025] Pure tone—A sound wave whose instantaneous pressure variation as a function of time is a sinusoidal function. Also called a simple tone.

[0026] Sine wave, sinusoidal vibration—A waveform whose pressure variation as a function of time is a sine function. This is the function relating the sine of an angle to the size of the angle.

[0027] Tone—A sound wave capable of exciting an auditory sensation having pitch.

[0028] Waveform—The form or shape of a wave. It may be represented graphically by plotting instantaneous amplitude, pressure, or intensity as a function of time.

[0029] White noise—Broadband noise having constant energy per unit of frequency.

Summary of Applicant's Invention

[0030] Tinnitus is often understood by a layman as a sound heard by an individual when there is no external sound present. According to the American Tinnitus Association, more than 50 million Americans suffer from tinnitus and unfortunately the cause or causes of tinnitus are not well understood by the medical community and there is currently no cure for the affliction so many tinnitus sufferers are often told by their doctor to learn to live with it.

[0031] In accordance with novel aspects of Applicant's novel apparatus and method, a monofrequency tinnitus patient is first sound-typed subjectively by the patient in terms of the frequency and amplitude (loudness) by comparing the tinnitus sound to the output of an external sound generator. The tinnitus patient adjusts the output of the sound generator until an exact match is identified and preferably this subjective sound typing is repeated a number of times in a blind manner, i.e. the patient during the sound-typing process does not see the frequency and amplitude displays of the sound generator. Based upon the sound-typing data, an external sound generator generates a sinusoidal tone equal in frequency and amplitude to the patient's monofrequency tinnitus sound and this externally generated tone is then phase shifted in a step-wise fashion or alternatively in a direct single motion through at least 180 degrees whereby the generated tone is phase shifted relative to an arbitrary point through a reciprocal relationship with the patient's tinnitus tone and the shifted sound wave is applied to the patient via high quality earphones thereby effecting a cancellation or a substantial diminishment of the patient's tinnitus tone.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] **FIG. 1** is a block diagram of monofrequency tinnitus treatment apparatus in accordance with aspects of Applicant's invention.

[0033] **FIG. 2** is a series of sine waves which graphically illustrate phase shift cancellation principles in accordance with further aspects of Applicant's invention, and

[0034] **FIG. 3** is a logic flow diagram illustrating one of Applicant's preferred sequence of steps to implement Applicant's phase shift process for treatment of monofrequency (pure tone) tinnitus patients.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0035] Referring now to **FIG. 1**, the preferred embodiment of apparatus for Applicant's novel phase shift treatment of monofrequency tinnitus patients is illustrated in block diagram form. A sound generator **10**, which may be an Agilent model 33120A function generator or any equivalent commercially available wave form generator, is coupled to a patient's headset **12** and to an input of an oscilloscope **14** which may, for example, be of the type commercially available in the U.S. from Tektronics, Inc. A second sound generator **16** is also coupled to another input of oscilloscope **14**.

[0036] Sound generator **10** has a plurality of adjustable knobs **18**, **20** and **22** and an output terminal **24**. As will be